# The Handbook of Glass Manufacture

3rd Edition

## Volume II

Compiled and Edited by

**Dr. Fay V. Tooley**

Industrial Consultant and
Professor of Glass Technology, Emeritus
Department of Ceramic Engineering
University of Illinois

**A book of reference for the plant executive, technologist and engineer.**

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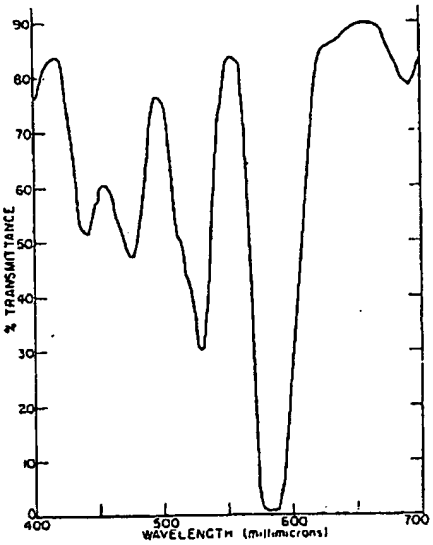


Figure 17. Spectral transmittance of didymium glass (Corning Glass Works Filter #5120).

these ions. Therefore they are less affected by the atomic environment and sharp line spectra (Fig. 17) are obtained. The resulting colors are a very pleasing purple for neodymium (which is used in art ware) and green for praseodymium. We can see that one of the absorption lines of neodymium is right at the wavelength of 589, the D line of the sodium spectra. Neodymium thus can be used when this line is to be suppressed (glass blowers' goggles) or when an instrument is to be calibrated. Neodymium glasses are dichroitic, that is, the color changes with thickness; it is bluish in thin, reddish in thick layers. Praseodymium and mixed neodymium praseodymium (didymium) glasses show similar effects. Neodymium can be used as one of the materials in decolorizers to compensate for yellow tints due to impurities. Its absorption spectrum makes it useful as a laser activator in glass. (See Subsection J(2)).

(8) Titanium[34] and Cerium[35]. Titanium and cerium in glass absorb primarily in the ultraviolet, and are important in UV absorbing glasses. The absorption band reaching into the visible can cause yellow and brown tints, which can be increased in certain base glasses, and, more so, by combining both ions with each other. A high sodium glass containing $TiO_2$ is hardly colored. High lead and boron glasses show more color.

Significant changes occur in the presence of other coloring ions. Small amounts of iron and titanium combine to form strong brown colors. Copper titanium glasses are green, manganese titanium glasses deep brown.

The color of cerium glasses is increased by oxidizing conditions as the equilibrium $Ce^{3+} \rightleftharpoons Ce^{4+}$ is shifted toward $Ce^{4+}$.

In colorless glasses exposed to high energy radiation cerium prevents the characteristic radiation coloration of glass while more ultraviolet absorption is produced by the radiation instead.

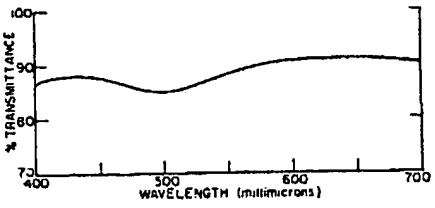


Figure 18. Spectral transmittance curve of selenium pink glass.

### F. Coloration by Sulfur, Selenium and Tellurium

(1) Elemental Sulfur and Selenium. In contrast to the colors produced by the absorption of radiant energy in the electronic shells of the transition elements described under 4.E, there are colors which resemble more those induced by definite compounds or bonds and are obtained by the replace